SCIENTIFIC AMERICAN

THE PHILIPPINE ISLANDS

THE BUREAU OF PRINTING

in the

PANAMA PACIFIC INTERNATIONAL EXPOSITION SN. FRANCISCO CALIFORNIA

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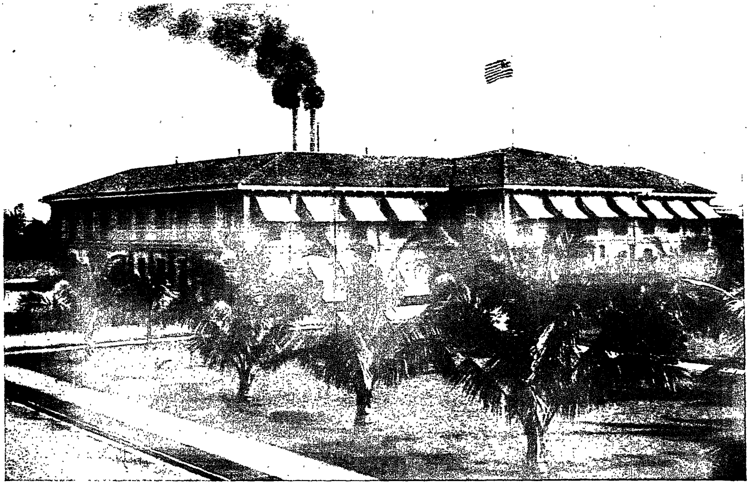
THE BUREAU OF PRINTING
MANILA, PHILIPPINE ISLANDS

THE ISLANDS

The Philippine Archipelago is composed of more than 3,000 islands, of which Mindanao and Luzon are the largest. Some 2,700 of them are small, each being less than 1 square mile in extent. The area of the islands of the group is estimated to be 115,000 square miles.



Main building of the Bureau of Printing

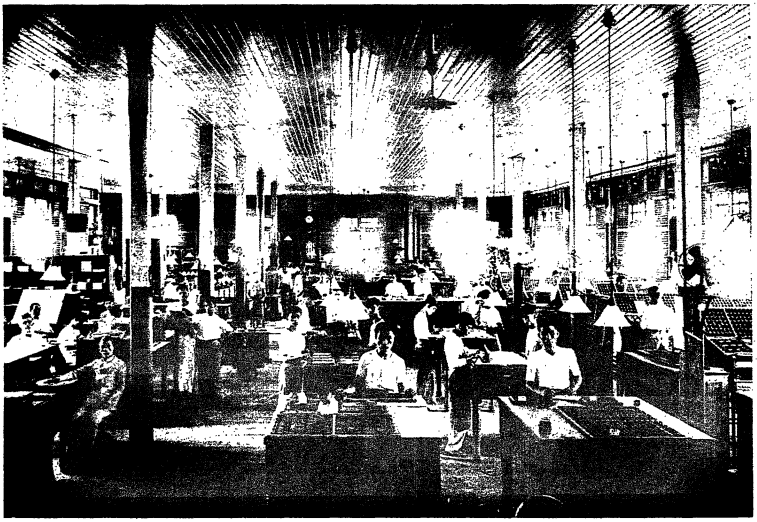
Y'Ami Island, about 1 mile in extent and the northernmost of the group, lies between 500 and 600 miles east of the southern coast of China, a little below the latitude of the city of Hongkong. More than 1,100 miles nearly due south of Y'Ami is Sitanki Island, the southernmost of the group, which lies a little more than 4½ degrees north of the equator and about 30 miles east of the great Island of Borneo.

The population is about 8,000,000. Officially the peoples are known as Christians and non-Christians. The Christians are credited as representing 90 per cent of the inhabitants; they comprise seven of the principal dialectic groups, which, arranged in the order of their rank in population, are as follows: Visayans, Tagalogs, Ilocanos, Bicols, Pangasinans, Pampangans, Cagayans. The non-Christian Igorots and the Mohammedan Moros are not without interest.

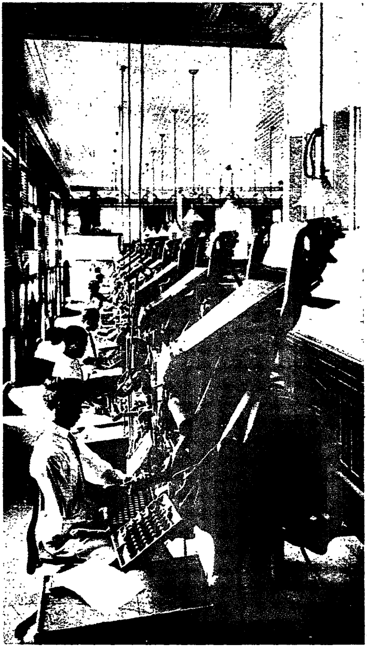
The "Bureau of Public Printing" was created by the Philippine Commission by a law approved November 7, 1901.

The pioneers chosen to install and prepare for operation a complete printing plant in a far-off land—alien in language, customs, and climate—performed a task of unusual proportions after encountering and overcoming many baffling details. To-day the Bureau of Printing compares favorably with any of the world's model printing plants, some of the Bureau's administrative features being used as models for other offices of the Philippine Government. Incidentally, it may be stated that the present Director is the sole representative in the Bureau of the first-comers.

The printing plant is delightfully located in Ermita, a district of the city of Manila, in an open space bounded on all sides by streets. The main building is of two stories, quadrangular in shape, and has a large open court spanned by a bridge. Its front faces Calle P. Burgos (the new name for Bagumbayan, well known to all who have visited Manila). It is flanked by the City Hall on the south and the Meehan Gardens (old name, Botanical Garden) on the north. Across the street at the rear is the Division Hospital of the United States Army. Between the front of the building and the street is a beautiful lawn divided by an ample driveway which leads from Calle P. Burgos to the main entrance. The second-story front affords a fine view of part of the



A general view of the Composing Division old moat—now filled in and parts of it devoted to playgrounds, tennis courts, baseball and football grounds, etc.—and an easterly portion of the ancient Spanish wall, built of stone, which surrounds old Manila, known as Intramuros by the Spaniards and natives, and called "the Walled City" by Americans. The first floor of the main building contains the power plant and machine shop, pressroom, electrotype and stereotype foundry, paper and general supplies storerooms, and public document sales office. On the second floor are the offices occupied by the Director, the Assistant Director, and other administrative offices, and the workrooms of the composing, bindery, and photo-engraving divisions.



Part of the battery of twenty linotypes, Composing Division

With due consideration of the requirements of the printing plant, it is found that the machinery, instruments, tools, and materials are efficient and well adapted, all being of the latest and most improved design.

Electric current generated by the power plant drives 147 motors ranging from ¼ to 7½ horsepower, furnishes 500 metallic-filament incandescent lights of 32 to 50 candlepower, supplies 10 electric heaters, and drives 47 ceiling and buzz fans.

The greater proportion of the type composition is accomplished by 20 linotype machines. The product of these machines shows a good average, keeping in mind that much of the copy is of a technical nature containing many unusual words, signs and symbols, black-faced type, italics, abbreviations, Latin, Greek, etc.; also nearly half of the composition is in Spanish, and occasionally jobs are set in one or more of the several native dialects.

The pressroom ably handles the portion of work assigned to it. High praise has been given for some of the three- and four-color half-tone work it has turned out. Its presses are capable of producing 50,000,000 impressions per year.

The bindery is well able to take care of all the work coming to it, from the wire-stitched folder to the large full-bound blank book. For exhibition purposes it has produced some handsome volumes with hand-tooling and gilded edges in ornamental design.

The photo-engraving room does zinc and copper half-tone and zinc line-etching work. It has also produced some very fine three- and four-color half-tone plates. Brass and steel dies for embossed work are cut when ordered.

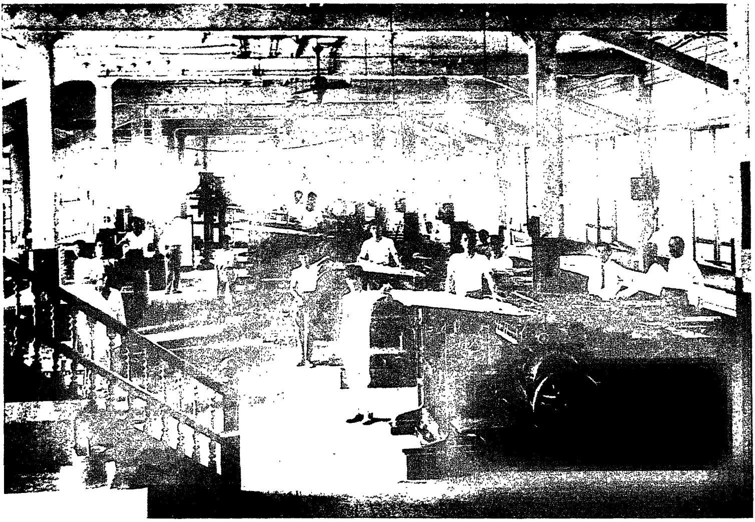
The electrotype and stereotype foundry, in addition to its regular work, also cuts steel dies for embossed work.

About 400 machines of various kinds are in use. Their efficient maintenance and repair is provided for by a well-equipped machine shop.

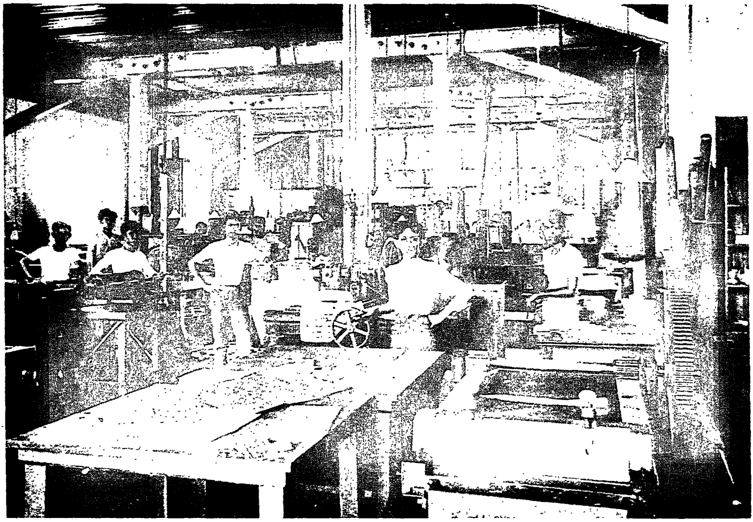
An interdivision telephone system contributes quick and easy communication between the various offices and divisions.

The items of production are of great variety. Possibly the largest item consists of blank forms and blank books. The next largest item is books of many kinds—laws and proceedings of the Legislature, decisions of the Supreme Court, reports of departments and bureaus, various manuals and regulations, and a number of periodical publications. In addition to the foregoing there is a large amount of miscellaneous work. The Bureau of Printing productions have gained the approval of some of the world's best-known master printers.

Nearly every item of material, machinery, paper, and supplies of all descriptions used by or entering into the finished product of the Bureau of Printing is imported from the United States. A "rush" order for materials, etc., from the United States requires about six months' time for delivery in Manila, and the regular orders come along in from nine to twelve months.



Cylinder-press section, Press Division



A general view of the Foundry Division

Sales of public documents average about ₱40,000 per annum.

The following gives an idea of the regularly issued publications:

OFFICIAL GAZETTE.

In the Official Gazette are printed: Laws and resolutions enacted by the Philippine Legislature and Philippine Commission; executive orders and proclamations issued by the Governor-General; decisions of the Philippine Supreme Court; orders of the Bureau of Customs; advertisements of various courts and offices of the Insular Government, composed mostly of land registration notices; and miscellaneous notices and orders of departments, bureaus, and offices of the Insular Government. Issued weekly. Annual volume makes about 2,300 pages. Size of type page, 7 by 10 inches.

GACETA OFICIAL.

Spanish edition of the Official Gazette. Averages about 2,400 pages per annum. Same contents and page size as the Official Gazette.

THE PHILIPPINE JOURNAL OF SCIENCE.

Published by the Bureau of Science in four sections, devoted to the following subjects:

Section A, chemical and geological sciences and the industries.
Section B, tropical medicine.
Section C, botany.
Section D, general biology, ethnology, and anthropology.

Each section is issued in 6 numbers per year, some of them profusely illustrated. The annual bound volume of each section averages over 400 pages, not including illustrations. Type page size, 4⅓ by 7⅔ inches.

PHILIPPINE AGRICULTURAL REVIEW.

Published by the Philippine Bureau of Agriculture. Devoted to agriculture, stock breeding, etc. Formerly issued monthly, now issued quarterly. Well illustrated. Annual bound volumes of past years averaged about 700 pages exclusive of illustrations. Size of type page, 4⅓ by 7⅝ inches.

REVISTA AGRÍCOLA DE FILIPINAS.

Spanish edition of the Agricultural Review. Same in all respects as the English edition. This publication has been discontinued, and in its stead The Philippine Farmer, an 8-page pamphlet, is to be published.

PHILIPPINE CRAFTSMAN.

Published by the Philippine Bureau of Education monthly during nine months of the school year (July to March). Devoted mainly to technical subjects pertaining to schools. The annual volume averages more than 700 pages; profusely illustrated. Size of type page, 4⅓ by 7⅝ inches.

MONTHLY WEATHER BULLETIN.

Published by the Philippine Weather Bureau. In this publication is found information of great value pertaining to the meteorology and the seismology of the Philippine Islands. The annual volume comprises about 400 pages. Size of type page, 6 by 9 inches.

BULLETIN OF THE PHILIPPINE LIBRARY.

Published by the Philippine Library monthly. Its main function is to show acquisitions to the library and reading lists of books on special subjects of current interest. Averages about 20 pages per number. Size of type page, 5 by 8 inches.

Finishers' section, Foundry Division

Forwarders' section, Bindery Division

BUREAU OF PUBLIC WORKS QUARTERLY BULLETIN.

Issued quarterly by the Philippine Bureau of Public Works. It is well illustrated and deals mainly with engineering problems concerning materials and the construction of buildings, bridges, and roads. It averages about 60 pages per number. Size of type page, 8 by 10½ inches.

QUARTERLY HEALTH REPORT.

Issued quarterly by the Philippine Bureau of Health. Contains statistical matter pertaining to the public health of the Philippine Islands. Averages about 50 pages per number. Size of type page, 7 by 10 inches.

The following is a statement of the principal kinds of papers consumed, including envelopes, for the fiscal years 1910 to 1914, inclusive:

Year.	Kind of paper.				Envelopes.
	Book.	Writing.	Bond and ledger.	Cardboard and bristol board.	
	Reams.	*Reams.*	*Reams.*	*Sheets.*	*Number.*
1910	4,020	5,116	1,788	171,550	3,691,171
1911	4,446	6,233	1,837	167,391	4,101,375
1912	5,860	6,496	1,927	239,737	4,773,325
1913	5,748	8,501	2,263	240,592	5,101,461
1914	5,321	8,048	1,937	204,462	5,724,361

SYSTEM OF APPRENTICE INSTRUCTION

The Bureau of Printing has instituted a system of apprentice instruction which is a radical departure from all known methods of vocational training. The practicability of its scheme has received world-wide approval. Leaders in the graphic arts and instructors in institutions devoted solely to teaching printing and its allied trades have expressed admiration at the fullness of its details and the coherence of its parts. Instructors in Harvard University, impressed with the thoroughness of the Bureau's system, have signified their intention of using its material in connection with the course in printing in the Harvard Graduate School of Business Administration.

The efficacy of the system is best evidenced by the evolution from an all-American force in 1902 to the present one composed of 94+ per cent of Filipino workmen. Of this native element, apprentices constitute 34.92 per cent. All of the mechanical work of the Bureau of Printing is being performed by Filipinos, Americans acting only in a supervisory capacity.

The following table, showing the American and Filipino employees in the Bureau of Printing for the periods stated, indicates the yearly progress the Filipinos have made:

Year ended—	Employees.		Year ended—	Employees.	
	American.	Filipino.		American.	Filipino.
Sept. 1, 1903	[a]67	175	June 30, 1910	27	317
Sept. 1, 1904	[a]52	222	June 30, 1911	27	377
Sept. 1, 1905	[a]42	250	June 30, 1912	28	434
June 30, 1906	37	252	June 30, 1913	30	464
June 30, 1907	31	265	Dec. 31, 1913	27	441
June 30, 1908	27	313	Sept. 30, 1914	[b]24	398
June 30, 1909	27	287			

[a] Information from annual reports.

[b] Thirteen of these are rated as craftsmen-instructors, the balance comprising administrative and other employees.

Apprentice instruction places the Bureau of Printing in a position unique among the world's printing offices. No other public or private *producing* establishment in existence is operated with so large a percentage of students comprising its technical force. In American and European printing offices the apportionment of apprentices to journeymen is on a basis of from 1-to-15 to 1-to-5, whereas in the Bureau of Printing the present ratio is about 1.1 apprentices to 1 native craftsman.

The Bureau, however, is not primarily a school of printing. It furnishes all the printing and binding for the Philippine Government and certain work for local stations of the United States Army and Navy. Among its customers are the various Insular bureaus and

Finishers and sewing machines, Bindery Division

offices, the Philippine Legislature, 38 provinces, and 725 municipalities. The plant is valued at ₱1,000,000.

The system of vocational training is commercially practicable in that it may be introduced into any manufacturing plant without any perceptible change in its routine, and apprentices may be paid wages from the date of the beginning of their apprenticeship.

Its principle, briefly, is this: The operations of each trade are segregated into specialties and subspecialties. These are divided into classes in the order of their relative importance, forming a systematic and coordinate sequence of instruction. A progressive schedule is thus provided—a step-by-step advancement which is as necessary to the proper industrial education of a boy as are the finger exercises in the acquirement of the finished technique of the expert musician.

The manner in which the specialties and subspecialties are arranged for each of the eight trades taught in the Bureau of Printing is shown in Plates I and II, pages 16, 17. Numbers are assigned to specialties and letters to subspecialties. Plates I and II pertain to the photo-engraving trade, which is divided into 41 specialties and 154 subspecialties.[1] The same general scheme is applied to each of the trades, the number of specialties and subspecialties in each division being as follows:

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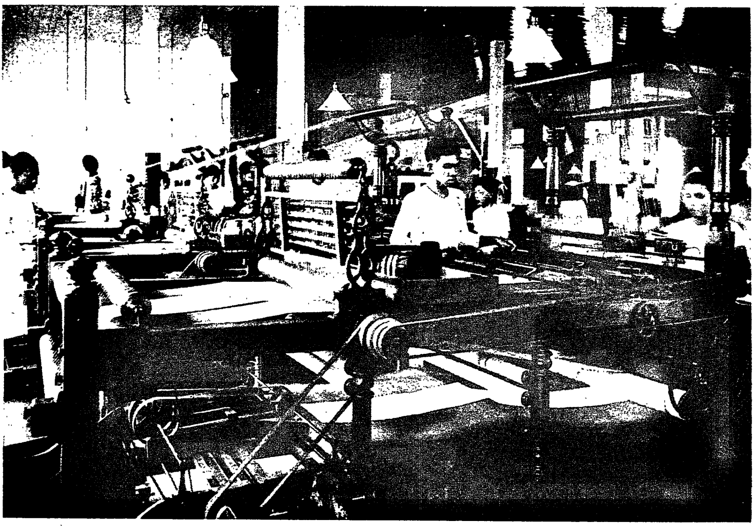
[1] In explanation of the hiatus from 32 to 101, it may be stated that the numbers assigned to specialties are the same for both the apprenticeship and cost-accounting systems of the Bureau, viz, 1 to 100, inclusive, for chargeable specialties; 101 and upward for nonchargeable specialties. A further division of chargeable specialties is made in those divisions having both machine and hand specialties, as follows: Machine, 1 to 50, inclusive; hand, 51 to 100, inclusive. This system of numbering enables the abstractor to make all entries from the workman's daily time ticket (pages 18 and 19) without reference to an explanatory list of specialties; and its advantages will be apparent when it is understood that machine and hand rates are segregated and that nonchargeable specialties ordinarily are not abstracted.

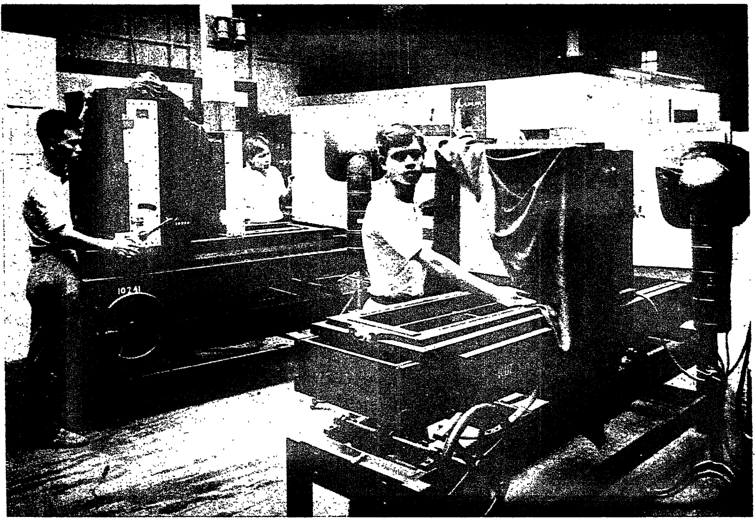
Trade.	Specialties.	Subspecialties.	Total.
Printer	47	258	305
Pressman	45	136	181
Bookbinder	74	196	270
Photo-engraver	41	154	195
Stereotyper and electrotyper	40	140	180
Total	247	884	1,131

Fifty-five specialties and 265 subspecialties are taught in the auxiliary trades of engineer, machinist, and electrician, making a grand total of 302 specialties and 1,149 subspecialties in the eight trades mentioned.

The specialties of each trade are distributed over seven periods, or four years in all. During the first three years (six periods of six months each) the student is designated as an "apprentice," and in the final period of one year he is known as a "junior craftsman." It is not contended that within that time a superior workman can be evolved from the crude material, but the four-year period of systematic instruction has proven adequate for turning out workmen who have assimilated a general knowledge of all the specialties of their trades. A comprehensive technical reference library, available to all, affords an excellent medium for self-education in office administration and organization, the



Ruling machines, Bindery Division



Cameras in the Photo-Engraving Division

relations of the various printing trades to each other, and the physical qualities of the more important printing-office materials.

Bureau of Printing apprentices have a distinct advantage in not being required to devote any part of their time to running errands, "sweeping out," and other tasks that usually occupy the greater part of the first year of apprentices elsewhere.

The first class period of six months is considered ample in which to determine an apprentice's fitness for the trade to which he has been assigned. If he shows inaptitude, particularly with respect to mechanical details, he is advised to seek other fields of labor. Justice to the employee as well as to the employer demands frankness in a matter that influences the formative period of a boy's life. If an apprentice demonstrates aptitude during his first class period but is unable to qualify for promotion within the prescribed period of six months, he is retained in the class until he has thoroughly mastered the specialties of that class period. The extension, however, in no case exceeds three months. If, after three months' extension, an apprentice fails to qualify for promotion, he is separated from the service.

A prerequisite to the success of any apprenticeship system is the employment of instructors who are thoroughly skilled in their work. The attitude of a craftsman-instructor toward an apprentice is similar to that of a teacher and pupil in a school. Instructors take a personal interest in the work of each apprentice, carefully explaining every operation. The apprentice is never forced to acquire his knowledge through chance contact with other workmen. He is given a scheduled task and shown the proper manner in which it should be performed.

Upon entrance each apprentice is given a pamphlet containing the office rules. Infractions of the rules and cases of carelessness and insubordination are made a matter of record. Verbal reprimands by craftsmen-instructors are not permitted. Adverse reports in the form of letters of reprimand are sent to the offending employees, who are given opportunity to make statements in their own behalf. Adverse reports are also made in cases of errors which are manifestly due to carelessness or inattention. These reports are filed, and when the employee's efficiency record is compiled a deduction is made for each. Letters of commendation are given to apprentices for exceptionally meritorious work.

Instruction in the operation and the ordinary adjustment of machinery is imparted by the immediate instructor, while the technical knowledge of a machine and its parts is acquired from the chief machinist. All power-driven machinery of the Bureau of Printing is inspected three times a year, according to a dated schedule.

The Bureau of Printing Desk Book is the only technical publication used in connection with apprentice instruction. It has been indorsed by American and foreign publishers and is recognized as a standard work of reference in the printing trades.

A comprehensive list of technical terms and definitions peculiar to each trade, printed in pamphlet form, is given to each apprentice, junior craftsman, and craftsman.

Apprentice etchers of the Photo-Engraving Division

Each apprentice is orally examined by his foreman as to his knowledge of such terms and definitions, and none is promoted who does not possess information to the extent of securing a passable rating.

After an employee has assumed the duties of a craftsman, additional responsibilities are placed upon him and every effort is made to inspire him with the confidence necessary to enable him to act in a minor executive capacity, such as assistant to the foreman or in charge of a group of workmen.

Apprentices are selected for appointment from lists of eligibles certified by the Bureau of Civil Service of the Philippine Government. Minimum and maximum age limits are 15 and 20 years, respectively. Each appointee must be in good physical condition and must weigh not less than 46 kilos (112 pounds) and be at least 155 centimeters (5 feet 1 inch) in height. His general fitness for an indoor occupation must be unquestioned.

Apprentices are rated on quantity of work; quality of work; aptitude and adaptability; habits, character, and conduct; and attendance and physical condition. Promotions from one class to another are made when the apprentice has qualified in all the specialties included in his current class. The Bureau's daily time ticket, a facsimile reproduction of which is shown in pages 18 and 19, is useful in determining the rating for quantity. The apprentice must have completed the full period of six months, as the class period is extended in an amount of time equal to that which may have been lost for any cause whatsoever.

Prior to promotion at the end of every class period and before graduation to craftsmanship, each apprentice is required to go to the examination room and, aided only by memory, write in English a theme on one or more subjects pertaining to his past or current work.

The Bureau of Printing has been a vocational school of the best kind for the Filipinos who have entered its service. They have learned the value of continued and earnest application to one of the most useful of arts, and to seek for superiority and excellence in their work. While the Bureau has been indispensable in the effective performance of the work of the Government, yet it has had even greater value as a training school for the Filipinos. It has been effective in improving the art of printing throughout the Islands and has also been a most useful instrumentality in extending the use of the English language through its dissemination by the intelligent and progressive young Filipinos who go from its service to engage in enterprises of their own or as the employees of others.

The success which has attended the technical training of apprentices in the Bureau of Printing has demonstrated beyond peradventure that the application of *system* to vocational training will produce efficient workmen in *any* of the skilled trades.

PLATE I

MANNER IN WHICH ALL OPERATIONS OF EACH TRADE ARE SEGREGATED INTO SPECIALTIES AND SUBSPECIALTIES. THE EIGHT TRADES TAUGHT IN THE BUREAU OF PRINTING CONSIST OF 302 SPECIALTIES AND 1,149 SUBSPECIALTIES. INSTRUCTION IN EACH TRADE IS IMPARTED ACCORDING TO AN INVARIABLE SCHEDULE (SEE PLATE II)

PHOTO-ENGRAVING SPECIALTIES

CHARGEABLE

1. **Alterations.**
2. **Anchoring:**
   - (*a*) Drilling anchor holes.
   - (*b*) Countersinking anchor holes.
   - (*c*) Outlining anchor marks.
   - (*d*) Tinning anchor marks.
   - (*c*) Casting anchors.
3. **Beveling, plain:**
   - (*a*) Adjusting mechanism.
   - (*b*) Aligning plate with line gauge and clamping down.
   - (*c*) Beveling, leaving plain border.
   - (*d*) Cutting graved or white line.
   - (*e*) Beveling, leaving black and white line border.
4. **Beveling, special (lining):**
   - (*a*) Adjusting mechanism.
   - (*b*) Aligning plate with line gauge.
   - (*c*) Cutting black and white lines in multiple or extended lines.
   - (*d*) Making raised border line by burring up.
   - (*c*) Cutting raised line down to printing surface and graving white line.
   - (*f*) Beveling.
5. **Blocking or mounting:**
   - (*a*) Adjusting mechanism.
   - (*b*) Center punching for countersinks.
   - (*c*) Drilling countersinks for tack heads.
   - (*d*) Planing blocking wood smooth on one side.
   - (*e*) Nailing cuts to blocks.
   - (*f*) Planing mounts type high.
   - (*g*) Trimming and squaring blocks.
   - (*h*) Sandpapering corners and raw edges.
   - (*i*) Routing out large blanks.
   - (*j*) Blocking or mounting to register.
6. Cut outs:
   - (*a*) Tooling outline.
   - (*b*) Routing.
   - (*c*) Trimming.
7. Cutting circles or ovals:
   - (*a*) Cutting cardboard mat to size.
   - (*b*) Trimming negative by mat.
   - (*c*) Tooling outline.
   - (*d*) Routing.
   - (*e*) Trimming.
8. Drawing (illustrating, designing, lettering):
   - (*a*) Pen.
   - (*b*) Wash.
   - (*c*) Air brush.
   - (*d*) Colors.
   - (*e*) Preparing black and white copy for color reproductions.
   - (*f*) Coloring transparencies.
8. Etching, copper, half-tone:
   - (*a*) Flat etch.
   - (*b*) Staging and reëtching.
   - (*c*) Trial proof.
   - (*d*) Preparing and mixing etching solutions.
10. Etching, copper, line:
    - (*a*) Etching line print.
    - (*b*) Retouching etching.
    - (*c*) Powdering and burning in line work.
    - (*d*) Preparing and mixing etching solutions.
11. Etching, half-tone, color:
    - (*a*) Flat etch.
    - (*b*) Trial proof.
    - (*c*) Staging and reëtching.
    - (*d*) Preparing and mixing etching solutions.
12. Etching, zinc, half-tone:
    - (*a*) Flat etch.
    - (*b*) Staging and reëtching.
    - (*c*) Trial proof.
    - (*d*) Preparing and mixing etching solutions.
13. **Etching, zinc, line.**
    - (*a*) Etching line print.
    - (*b*) Retouching etching.
    - (*c*) Powdering and burning in line work.
    - (*d*) Preparing and mixing etching solutions.
14. **Finishing, half-tone:**
    - (*a*) Spotting.
    - (*b*) Extending corner lines.
    - (*c*) Burnishing.
15. **Finishing, half-tone, color:**
    - (*a*) Spotting.
    - (*b*) Extending corner lines.
    - (*c*) Burnishing.
    - (*d*) Outlining for cut outs.
    - (*c*) Trimming cut outs.
    - (*f*) High-lighting.
16. **Finishing, line:**
    - (*a*) Spotting.
    - (*b*) Trimming.
    - (*c*) Repairing.
    - (*d*) Correcting.
17. **Mortising:**
    - (*a*) Adjusting mechanism.
    - (*b*) Outside mortising.
    - (*c*) Inside mortising.
18. **Mounting or grouping original copy:**
    - (*a*) Grouping of copy for half-tone reproduction.
    - (*b*) Grouping negatives for printing.
    - (*c*) Grouping or arranging objects for half-tone reproduction, color work, and dry-plate photography.
19. **Photographing, color operating; making color record negatives:**
    - (*a*) Color sensitizing dry plates.
    - (*b*) Focusing color copy.
    - (*c*) Exposing color sensitized plates through color filters.
    - (*d*) Developing record negatives.
    - (*e*) Clearing and fixing record negatives.
    - (*f*) Intensifying record negatives.
    - (*g*) Reducing record negatives.
    - (*h*) Printing transparencies from record negatives.
    - (*i*) Developing transparencies.
    - (*j*) Clearing and fixing transparencies.
    - (*k*) Intensifying transparencies.
    - (*l*) Reducing transparencies
    - (*m*) Preparing dye solutions for color sensitizing.
    - (*n*) Preparing and mixing chemicals.
20. **Photographing, dry-plate work:**
    - (*a*) Interior views.
    - (*b*) Outside views.
    - (*c*) Copying prints, enlargement or reduction.
    - (*d*) Preparing copy from colored pictures or objects for half-tone reproduction.
    - (*e*) Making transparencies.
    - (*f*) Mounting prints.
    - (*g*) Preparing and mixing chemicals.
21. **Photographing, half-tone:**
    - (*a*) Focusing copy.
    - (*b*) Collodionizing and sensitizing plates.
    - (*c*) Adjusting screen.
    - (*d*) Placing plate in plate holder and timing exposure.
    - (*e*) Developing negative.
    - (*f*) Clearing negative.
    - (*g*) Intensifying negatives.
    - (*h*) Clearing and cutting negative with cyanide.
    - (*i*) Final intensification.
    - (*j*) Preparing and mixing chemicals.
22. **Photographing, half-tone, special (reproduction of pencil drawings, etchings, and steel or copperplate prints).**
23. **Photographing, line:**
    - (*a*) Focusing line.
    - (*b*) Collodionizing and sensitizing plate.
    - (*c*) Placing plate in plate holder and timing exposure.
    - (*d*) Developing negative.
    - (*e*) Clearing out developer with cyanide.
    - (*f*) Intensifying negative.
    - (*g*) Clearing negative.
    - (*h*) Final intensification.
    - (*i*) Final clearing.
24. **Printing negatives:**
    - (*a*) Sawing and polishing metal.
    - (*b*) Coating metal with sensitizing solution.
    - (*c*) Printing negatives.
    - (*d*) Rolling up print.
    - (*e*) Washing and developing out plate after printing.
    - (*f*) Burning or baking in enamel.
    - (*g*) Retouching print.
    - (*h*) Preparing and mixing line and half-tone printing solutions.
25. **Proofing:**
    - (*a*) Black and white.
    - (*b*) Color.
26. **Reëngraving.**
27. **Retouching:**
    - (*a*) Copy.
    - (*b*) Negatives.
    - (*c*) Plates.
28. **Routing:**
    - (*a*) Adjusting mechanism.
    - (*b*) Line work.
    - (*c*) Half-tone cut out work.
    - (*d*) Sharpening router bits.
29. **Stripping negatives;**
    - (*a*) Coating negatives with rubber.
    - (*b*) Coating negatives with collodion.
    - (*c*) Cutting and squaring negative film.
    - (*d*) Stripping, reversing, and transferring negative film to plate glass.
    - (*e*) Preparing and mixing stripping solutions.
30. **Transparencies.**
81. **Vignetting:**
    - (*a*) Outlining.
    - (*b*) Tooling.
    - (*c*) Etching.
    - (*d*) Routing.
    - (*e*) Trimming.
    - (*f*) Underlaying.
32. **Zinc overlays:**
    - (*a*) Cutting zinc to size.
    - (*b*) Cleaning and polishing.
    - (*c*) Drying.
    - (*d*) Pulling offset on zinc.
    - (*e*) Retouching zinc offset.
    - (*f*) Powdering and burning in.
    - (*g*) Etching.

NONCHARGEABLE

101. Cleaning machinery.
102. Corrections, office.
103. Instructing apprentices.
104. Laborer.
105. Mixing and preparing chemicals.
106. Practice work.
107. Supervising, inspecting finished product, and similar work.
108. Waiting for repairs (write name of machine.)
109. Waiting for work (will not be allowed unless employee reports immediately to the Foreman).

PLATE II

SHOWING THE MANNER IN WHICH SPECIALTIES AND SUBSPECIALTIES ARE DIVIDED INTO CLASSES IN THE ORDER OF THEIR RELATIVE IMPORTANCE, MAKING A SYSTEMATIC AND COÖRDINATE SEQUENCE OF INSTRUCTION

APPRENTICE

THREE YEARS, DIVIDED INTO SIX CLASSES OF SIX MONTHS EACH

Class 6 (Entrance).

- 24. Printing negatives [line]:
  - (a) Sawing and polishing metal.
  - (b) Coating metal with sensitizing solution.
  - (c) Printing negatives.
  - (d) Rolling up print.
  - (e) Washing and developing out plate after printing.
  - (f) Burning or baking in enamel.
  - (g) Retouching print.
  - (h) Preparing and mixing line and half-tone printing solutions.
- 13. Etching, zinc, line:
  - (a) Etching line print.
  - (b) Retouching etching.
  - (c) Powdering and burning in line work.
  - (d) Preparing and mixing etching solutions.
- 5. Blocking or mounting:
  - (a) Adjusting mechanism.
  - (b) Center punching for countersinks.
  - (c) Drilling countersinks for tack heads.
  - (d) Planing blocking wood smooth on one side.
  - (e) Nailing cuts to blocks.
  - (f) Planing mounts type high.
  - (g) Trimming and squaring blocks.
  - (h) Sandpapering corners and raw edges.
  - (i) Routing out large blanks.
  - (j) Blocking or mounting to register.
- 105. Mixing and preparing chemicals.

Class 5.

- 28. Routing:
  - (a) Adjusting mechanism.
  - (b) Line work.
  - (c) Half-tone cut out work.
  - (d) Sharpening router bits.
- 17. Mortising:
  - (a) Adjusting mechanism.
  - (b) Outside mortising.
  - (c) Inside mortising.
- 29. Stripping negatives [line]:
  - (a) Coating negatives with rubber.
  - (b) Coating negatives with collodion.
  - (c) Cutting and squaring negative film.
  - (d) Stripping, reversing, and transferring negative film to plate glass.
  - (e) Preparing and mixing stripping solutions.
- 105. Mixing and preparing chemicals.

Class 4.

- 24. Printing negatives [half-tone]:
  - (a) Sawing and polishing metal.
  - (b) Coating metal with sensitizing solution.
  - (c) Printing negatives.
  - (e) Washing and developing out plate after printing.
  - (f) Burning or baking in enamel.
  - (g) Retouching print.
  - (h) Preparing and mixing line and half-tone printing solutions.
- 32. Zinc overlays:
  - (a) Cutting zinc to size.
  - (b) Cleaning and polishing.
  - (c) Drying.
  - (d) Pulling offset on zinc.
  - (e) Retouching zinc offset.
  - (f) Powdering and burning in.
  - (g) Etching.
- 10. Etching, copper, line:
  - (a) Etching line print.
  - (b) Retouching etching.
  - (c) Powdering and burning in line work.
  - (d) Preparing and mixing etching solutions.
- 105. Mixing and preparing chemicals.

Class 3.

- 29. Stripping negatives [half-tone]:
  - (a) Coating negatives with rubber.
  - (b) Coating negatives with collodion.
  - (c) Cutting and squaring negative film.
  - (d) Stripping, reversing, and transferring negative film to plate glass.
  - (e) Preparing and mixing stripping solutions.
- 18. Mounting or grouping original copy:
  - (b) Grouping negatives for printing.
- 12. Etching, zinc, half-tone:
  - (a) Flat etch.
  - (b) Staging and reëtching.
  - (c) Trial proof.
  - (d) Preparing and mixing etching solutions.
- 3. Beveling, plain:
  - (a) Adjusting mechanism.
  - (b) Aligning plate with line gauge and clamping down.
  - (c) Beveling, leaving plain border.
  - (d) Cutting graved or white line.
  - (e) Beveling, leaving black and white line border.
- 4. Beveling, special (lining):
  - (a) Adjusting mechanism.
  - (b) Aligning plate with line gauge.
  - (c) Cutting black and white lines in multiple or extended lines.
  - (d) Making raised border line by burring up.
  - (e) Cutting raised line down to printing surface and graving white line.
  - (f) Beveling.
- 16. Finishing, line:
  - (a) Spotting.
  - (b) Trimming.
  - (c) Repairing.
  - (d) Correcting.
- 25. Proofing:
  - (a) Black and white.
- 105. Mixing and preparing chemicals.

Class 2.

- 1. Alterations.
- 2. Anchoring:
  - (a) Drilling anchor holes.
  - (b) Countersinking anchor holes.
  - (c) Outlining anchor marks.
  - (d) Tinning anchor marks.
  - (e) Casting anchors.
- 9. Etching, copper, half-tone:
  - (a) Flat etch.
  - (b) Staging and reëtching.
  - (c) Trial proof.
  - (d) Preparing and mixing etching solutions.
- 27. Retouching:
  - (c) Plates.
- 14. Finishing, half-tone:
  - (a) Spotting.
  - (b) Extending corner lines.
  - (c) Burnishing.
- 6. Cut outs:
  - (a) Tooling outline.
  - (b) Routing.
  - (c) Trimming.
- 7. Cutting circles or ovals:
  - (a) Cutting cardboard mat to size.
  - (b) Trimming negative by mat.
  - (c) Tooling outline.
  - (d) Routing.
  - (e) Trimming.
- 31. Vignetting:
  - (a) Outlining.
  - (b) Tooling.
  - (c) Etching.
  - (d) Routing.
  - (e) Trimming.
  - (f) Underlaying.
- 105 Mixing and preparing chemicals.

Class 1.

- 23. Photographing, line:
  - (a) Focusing line.
  - (b) Collodionizing and sensitizing plates.
  - (c) Placing plate in plate holder and timing exposure.
  - (d) Developing negative.
  - (e) Clearing out developer with cyanide.
  - (f) Intensifying negative.
  - (g) Clearing negative.
  - (h) Final intensification.
  - (i) Final clearing.
- 21. Photographing, half-tone:
  - (a) Focusing copy.
  - (b) Collodionizing and sensitizing plates.
  - (c) Adjusting screen.
  - (d) Placing plate in plate holder and timing exposure.
  - (e) Developing negative.
  - (f) Clearing negative.
  - (g) Intensifying negatives.
  - (h) Clearing and cutting negative with cyanide.
  - (i) Final intensification.
  - (j) Preparing and mixing chemicals.
- 18. Mounting or grouping original copy:
  - (a) Grouping of copy for half-tone reproduction.
- 22. Photographing, half-tone, special (reproduction of pencil drawings, etchings, and steel or copperplate prints).
- 105. Mixing and preparing chemicals.

JUNIOR CRAFTSMAN

ONE YEAR

This period shall be devoted to a review of the work of apprenticeship. In addition, elementary work shall be done on the following specialties should there be sufficient work to afford the opportunity and the junior craftsman have demonstrated more than average proficiency in all of his previous work.

- 20. Photographing, dry-plate work:
  - (a) Interior views.
  - (b) Outside views.
  - (c) Copying prints, enlargement or reduction.
  - (d) Preparing copy from colored pictures or objects for half-tone reproduction.
  - (e) Making transparencies.
  - (f) Mounting prints.
  - (g) Preparing and mixing chemicals.
- 18. Mounting or grouping original copy:
  - (c) Grouping or arranging objects for half-tone reproduction, color work, and dry-plate photography.
- 30. Transparencies.
- 27. Retouching:
  - (a) Copy
  - (b) Negatives.

- 19. Photographing, color operating; making color record negatives:
  - (a) Color sensitizing dry plates.
  - (b) Focusing color copy.
  - (c) Exposing color sensitized plates through color filters.
  - (d) Developing record negatives.
  - (e) Clearing and fixing record negatives.
  - (f) Intensifying record negatives.
  - (g) Reducing record negatives.
  - (h) Printing transparencies from record negatives.
  - (i) Developing transparencies.
  - (j) Clearing and fixing transparencies.
  - (k) Intensifying transparencies.
  - (l) Reducing transparencies.
  - (m) Preparing dye solutions for color sensitizing.
  - (n) Preparing and mixing chemicals.
- 11. Etching, half-tone, color:
  - (a) Flat etch.
  - (b) Trial proof.
  - (c) Staging and reëtching.
  - (d) Preparing and mixing etching solutions.

- 15. Finishing, half-tone, color:
  - (a) Spotting.
  - (b) Extending corner lines.
  - (c) Burnishing.
  - (d) Outlining for cut outs.
  - (e) Trimming cut outs.
  - (f) High-lighting.
- 25. Proofing.
  - (b) Color.
- 26. Reëngraving.
- 8. Drawing (illustrating, designing, lettering):
  - (a) Pen.
  - (b) Wash.
  - (c) Air brush.
  - (d) Colors.
  - (e) Preparing black and white copy for color reproductions.
  - (f) Coloring transparencies.
- 105. Mixing and preparing chemicals.

WORKMAN'S DAILY TIME TICKET

PHOTO-ENGRAVING DIVISION

REGULAR TIME

Date.............. I certify on my official oath that the time noted on this ticket is correct.

Rate of pay, $........... Name ....
Craftsman. Junior Craftsman. Apprentice. Helper.

A. M.						P. M.					
Work Order Number.	Time.	Part	Specialty Number; also Quantity when Ordered.	Office Use.		Work Order Number.	Time.	Part.	Specialty Number; also Quantity when Ordered.	Office Use.	
	8.00			Hand.	Mach.		1.00			Hand.	Mach.
	8.06	1					1.06	41			
	8.12	2					1.12	42			
	8.18	3					1.18	43			
	8.24	4					1.24	44			
	8.30	5					1.30	45			
	8.36	6					1.36	46			
	8.42	7					1.42	47			
	8.48	8					1.48	48			
	8.54	9					1.54	49			
	9.00	10					2.00	50			
	9.06	11					2.06	51			
	9.12	12					2.12	52			
	9.18	13					2.18	53			
	9.24	14					2.24	54			
	9.30	15					2.30	55			
	9.36	16					2.36	56			
	9.42	17					2.42	57			
	9.48	18					2.48	58			
	9.54	19					2.54	59			
	10.00	20					3.00	60			
	10.06	21					3.06	61			
	10.12	22					3.12	62			
	10.18	23					3.18	63			
	10.24	24					3.24	64			
	10.30	25					3.30	65			
	10.36	26					3.36	66			
	10.42	27					3.42	67			
	10.48	28					3.48	68			
	10.54	29					3.54	69			
	11.00	30					4.00	70			
	11.06	31									
	11.12	32									
	11.18	33									
	11.24	34									
	11.30	35									
	11.36	36									
	11.42	37									
	11.48	38									
	11.54	39									
	12.00	40									

O. K. ....
For the Foreman.

ACCURATE TIME MUST BE KEPT.

(SEE OTHER SIDE FOR NUMBERED SPECIALTIES AND INSTRUCTIONS)

Upon beginning work, the employee enters the work-order number and the specialty number in the respective columns. If the time of beginning is 8 o'clock, the work-order and specialty numbers are entered opposite the first part or period—8.06 o'clock. Each period consists of six minutes, and the time printed is the last minute of the period. Should work on a different specialty on the same work order be started at 8.30 o'clock, then that specialty number is entered in the space directly opposite 8.36. One entry of a work-order number is sufficient, and this entry is made at the time of beginning a new work order. It is not necessary to mark off the time on this ticket, as the form has been ruled to obviate such work. All numbers must be carefully verified.

PHOTO-ENGRAVING DIVISION

WORKMAN'S DAILY TIME TICKET

SPECIALTIES

Chargeable

1. Alterations.
2. Anchoring.
3. Beveling, plain.
4. Beveling, special (lining).
5. Blocking or mounting.
6. Cutouts.
7. Cutting circles or ovals.
8. Drawing (illustrating, designing, lettering).
9. Etching, copper, half-tone.
10. Etching, copper, line.
11. Etching, half-tone, color.
12. Etching, zinc, half-tone.
13. Etching, zinc, line.
14. Finishing, half-tone.
15. Finishing, half-tone, color.
16. Finishing, line.
17. Mortising.
18. Mounting or grouping original copy.
19. Photographing, color operating; making color record negatives.
20. Photographing, dry-plate work.
21. Photographing, half-tone.
22. Photographing, half-tone, special (reproduction of pencil drawings, etchings, and steel or copperplate prints).

Chargeable—Continued

23. Photographing, line.
24. Printing negatives.
25. Proofing.
26. Reëngraving.
27. Retouching.
28. Routing.
29. Stripping negatives.
30. Transparencies.
31. Vignetting.
32. Zinc overlays.

Nonchargeable

101. Cleaning machinery.
102. Corrections, office.
103. Instructing apprentices.
104. Laborer.
105. Mixing and preparing chemicals.
106. Practice work.
107. Supervising, inspecting finished product, and similar work.
108. Waiting for repairs (write name of machine).
109. Waiting for work (will not be allowed unless employee reports immediately to the foreman).

DESCRIPTION OF WORKMAN'S DAILY TIME TICKET

Arrangement.—The face of the ticket contains a complete record of the day's work, as well as all data pertaining to the compensation and status of the workman. This information is valuable to the instructor in determining the rating for "quantity" and to the inspector or computer in cases of excessive time. It enables the abstractor to complete and total all entries at a glance.

Sexagesimal notation.—Calculations are greatly simplified by dividing the time into six-minute periods, or the hour into tenths. The abstractor is further aided by reason of the heavy line under each fifth period, which divides the workday into half-hour periods.

Advantages of the printed horizontal lines.—The original Bureau of Printing time tickets were printed without horizontal lines under the different periods. These were drawn by the workman upon the completion of each work order or specialty. This work was not only objectionable to the workman, but the completed ticket, particularly for small work, was in many cases so badly accomplished and soiled as to greatly increase the work of abstracting. The elimination of this work through the printing of the horizontal lines has reduced the number of entries to the minimum.

The "Part" column.—The "Part" column enables the abstractor to determine at a glance how many tenths of an hour are consumed. The value of this time for any wage is quickly obtained by referring to a prepared table of computations, with the different rates of pay as headings of columns and the parts from 1 up as a guide column.

How to obtain quantity.—It is necessary at times to know the quantity of production. Provision is made for such information in the "Specialty" column.

Specialties, and how numbered.—Plate I shows the manner in which specialties are numbered. As all data required for abstracting purposes are shown on the face of the ticket, this system enables one Filipino clerk to abstract the daily time tickets of several hundred workmen.

(Owing to limited space, only a reduction of the front of the time ticket is shown on the opposite page. The actual size of the ticket is 7 by 8½ inches. The reverse sides of originals contain detailed instructions relative to making out the ticket, as well as a complete list of specialties of each mechanical division. Plates I, II, and III refer to photo-engraving operations.)

How chargeable time is gathered.—Chargeable hours only are gathered unless information is desired on a nonchargeable specialty. The total of nonchargeable hours is obtained by subtracting the gathered chargeable hours from the pay-roll hours.

Miscellaneous advantages of a time ticket.—It constitutes the most accurate record of a workman's efficiency.

It is the only means of accurately determining the cost of the individual job.

It is indispensable in formulating a scale of charges, for without reliable data as to costs the fixing of charges would be mere guesswork.

It provides accurate information relative to the status of a work order.